Coll. Antropol. **35** (2011) 3: 867–871
Original scientific paper

Complications after Hip Rearthroplastics with Revision Endoprosthesis

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A B S T R A C T

The stability of the revision endoprosthesis components is more difficult to achieve than in primary endoprosthesis due to large bone defects and/or decreased bone mass quality. That is the reason for more frequent complications for revision than in primary arthroplasty. The aim of this study was to investigate the frequency of complications in 122 patients who were operated with the revision endoprosthesis in the Department of Orthopedics in University Hospital Split in the period of 1998 to 2007 and accepted to participate in this study. There were 3 patients treated on bought hips. The average follow up time was four years (0.6–10.6). There were 32 (26.2%) males and 90 (73.8%) females. The average age was 70.66±7.63 years. The average time from operation to physical therapy was 3.53±2.56 days. There were 27 (21.6%) complications. The most common complication was infection in 9 (7.2%) cases. From those cases, 4 (3.2%) had superficial, and 5 (4%) had deep infection. From other complications, there were 5 (4%) endoprosthesis reluxations, 2 (1.6%) periprosthetic femur fractures, 5 (4%) urinary infections, and 6 (4.8%) other complications (lung mycroembolia, heart infarction, lumbal plexus lesion from L2, spinal cord infarction with paraplegia, pneumonia and severe sacral bed-sore). There were 10 (8%) re-interventions following the revision arthroplasty. The result was good or excellent in 80% of operated patients, satisfied in 17%, and bad in 3%. The revision hip procedures are characterized with a high complications incidence rate. Our results are comparable with the results from literature.

Key words: *hip rearthroplasty, revision endoprothesis, complications*

Introduction

The hip arthroplasty represents one of the greatest scinetific achievements in modern orthopedics. It allows the aspiration for painlessness and movements in a rehabilitee with improved quality of life. According to literature, the primary hip arthroplasty with total endoprosthesis survival rate has improved[1] and it is over 95% in patients older than 75 years monitored at 10 years follow up[2]. Despite all positive results, there are many possible complications after hip arthroplasty. Some of the most important risk factors for primary hip arthroplasty complications are: younger patients, males, physical activity, an increased body weight, disease which is an indication for hip arthroplasty (e.g. developmental hip anomaly), endoprosthesis type, surgeon experience, and time of procedure duration. The most important later complications are: aseptic loosening and deep infection[3]. These complications are the main causes for hip rearthroplasty. The number of the hip rearthroplasty procedures is increased because of the society getting older, prolonged average life duration and increased number of primary arthroplasties, especially in younger and more active patients[4]. According to the Swedish Hip Register between year 1986 and 1995 the revision rate was 7%[5] whereas there were more than 10% of primary implants revisions in 1998[6]. There are number of difficulties in revision endoprosthesis stability because of severe bone defects and decreased bone mass[7]. That may be the reason for complications being more frequent than in primary arthroplasty[8]. The survivorship for revision total hip arthroplasty using second revision was 82% at 10 years[9]. We wanted to evaluate the complications of our patients who underwent a revision alloarthroplasty with total revision hip endoprosthesis.

Patients and Methods

We retrospectively invedtigated the patients treated at the Department of Orthopedics, Split University Hos-

Received for publication May 20, 2009

pital Center, Split, Croatia between 1998 and 2007 with total revision hip endoprosthesis implantation. The total of 2572 primary hip endoprosthesis and 292 revision endoprosthesis were implanted during that period. Primary hip endoprosthesis represented 90%, and revision endoprosthesis 10% of total hip arthroplasties (Table 1, Figure 1).

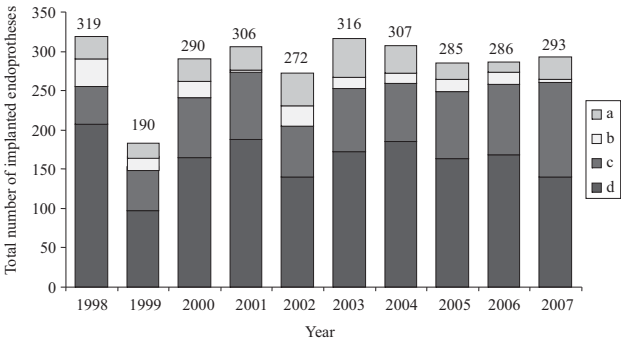

Fig. 1. Number of implanted hip endoprostheses in the period of 1998 to 2007, a – revision, b – partial, c – noncemented, d – cemented.

From 292 patients treated with the revision total hip endoprosthesis, 122 (response rate of 41.8%) responded to our call for participation in this study and only their data were taken for analysis. There were three patients who were treated with revision total hip endoprostesis on bought hips. We evaluated the data from patient's medical records as well as data from patient's examination tests during 2008 year which were composed of low limbs functional condition evaluation. We used Harris Hip Score (HHS)[10], and radiological (X-ray) tests for clinical results evaluation. The HHS, a hip-specific instrument evaluates pain, function, activity, and motion on a 0 – 100 scale (where 100=best). A total score below 70 points was considered as a poor result, 70–80 as a fair, 80–90 as a good, and 90–100 as an excellent result[11]. The radiological evaluation of the acetabular component was performed according to the criteria of DeLee and Charnley[12]. The acetabular component was considered to be loose if a continuous radiolucent line was evident in all three zones or if the acetabular component migrated. Fixation of the cementless femoral component was evaluated according to the criteria described by Engh et al.[13]. The loosening of the cemented femoral component was evaluated according to the criteria described by Harris et al.[14].

The SPSS 11.0 for Windows computer software (SPSS Inc., Chicago, IL, USA) was used for statistic analyze. P value less than 0.05 was considered significant.

TABLE 1
NUMBER OF IMPLANTED HIP ENDOPROSTHESES BETWEEN YEARS 1998 AND 2007

Model	Number	%
Uncemented	783	27
Cemented	1624	57
Partial	165	6
Rearthroplasty	292	10
Total	2864	100

Results

Total of 41.8% (122/292) patients who were operated with revision hip endoprosthesis responded to our call, and were included in this study. There were 90 (73.8%) females and 32 (26.2%) males. The average age was 70.66±7.63 years. There were 57 (45.6%) leftsided endoprosteses, 65 (52%) rightsided endoprostheses and 3 (2.4%) bilateral endoprosteses. The average time of primary implant duration (time from primary arthroplasty) was 124.89±62.06 months. The average follow up time was 4 years (0.6–10.6 years).

The indications for rearthroplasty were: aseptic loosening in 111 (88.8%) cases, reimplantation following Girdlestone removal of a septic prosthesis in 6 (4.8%), recurrent dislocation in 3 (2.4%), stem fracture in 3 (2.4%) and periprosthetic femur fracture in 2 (1.6%) cases (Figure 2). The types of implanted revision total hip endoprosteses are presented in Table 2. The femoral head bone allograft from bone bank was used in 21 (16.8%) cases, 16 in combination of press-fit cup with impacted morselized bone graft and 5 in cemented cup with femoral head structural allograft.

The average time of procedure duration was 170.33± 44.67 minutes. The antibiotic prophylaxis and thrombo-

TABLE 2
REVISION TOTAL ENDOPROTHESIS TYPE

Revision total hip endoprosthesis type	Number	%
Uncemented:	67	
S-Rom	14	53.6
Link	3	
Zimmer	50	
Cemented	22	17.6
Hybrid:	36	
uncemented acetabulum-cemented stem	33	28.8
cemented acetabulum-uncemented stem	3	
Total	125	100

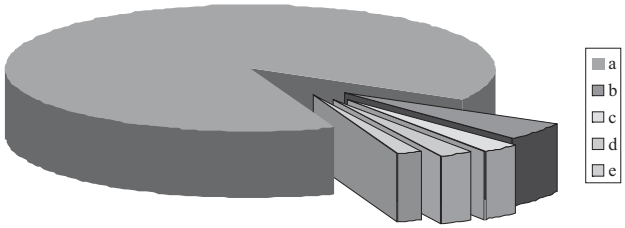

Fig. 2. Indications for rearthroplasty, a – aseptic instability, b – infection c – reluxation, d – femur stem fracture, e – periprosthetic femur fracture.

prophylaxis were included for all patients according to the Departmental algorithm. The antibiotic prophylaxis was performed using Cephtriaxon (Rocephin, F. Hoffmann – La Roche Ltd, Basel, Switzerland) 2 g preoperatively, on the day of surgery and 1 g/day during first and second postoperative day. The thromboembolic prophylaxis was performed using low-molecular heparin, Enoxaparinum natrium (Clexane, Sanofi Winthorp Industrie, Le Trait, France), in a dose of 4000 i.u. 12 hours before surgery, continued on the day of surgery and after procedure till the 24th postoperative day. The drainage tube was removed after 2.05±0.42 days in average. The physical therapy started after 3.53±2.56 days in average. The average hospitalization duration was 19.27±7.32 days.

The last follow-up of Harris hip score was good or excellent in 100 (80%), fair in 21 (16.8%), and poor in 4 (3.2%) cases (Table 3). Four acetabular and femoral components failed, and three were removed due to septic loosening. Radiological evaluation of the other acetabular and femoral components was categorized as probably and possibly loose.

There were 27 (21.6%) complications. The most usual complication was infection in 9 (7.2%) patients (4 (3.2%) with superficial and 5 (4%) with deep infection). Two out of five deep infections were caused by meticilin-resistent *Staphylococcus aureus* (MRSA) (Table 4). The superficial infections were healed during hospitalization using antibiotics. There were also: 5 (4%) patients with endoprosthesis reluxation, 2 (1.6%) patients with periprosthetic femur fracture, 5 (4%) patients with urinary infection, and 6 (4.8%) patients with some other complication (lung mycroembolia, heart infarction, lumbal plexus lesion from L2, spinal cord infarction with paraplegia, pneumonia and severe sacral bed-sore).

There were 10 (8%) re-interventions inside three years from hip rearthroplasty. Re-rearthroplasty was performed in 6 of those patients (in 3 patients after deep infection was healed with Girdlestone procedure[15], and in 3 patients because of reluxation). Uncemented modulate ZMR revision endoprostheses were used in these cases. In 3 of those patients the treatment outcome was excellent (one with deep infection and two with reluxation). From three patients with poor results, two patients had reinfection with MRSA. The same procedure was repeated with the interval of safety over one year when another unsuccessful arthroplasty was performed. They developed another infection with the same microbe. In one of these patients the endoprothesis was removed in an emergency procedure. This patient is now without the signs of infection but with poor functional result. The patient can walk inside the apartment using the orthopedic walking help tool. The second patient was in good removed out immediately but the low limb gangrene was developed. The hip disarticulation was performed but the patient died after that (Figure 3). The third patient suffered a cerebrovascular insult after six months and died.

TABLE 4
COMPLICATION FOLLOWING HIP REARTHROPLASTY

Complication	Number	%
Infection	9	7.2
superficial	4	3.2
deep	5	4
Reluxation	5	4
Femur fracture	2	1.6
Urinary infection	5	4
Other	6	4.8
Total	27	21.6

The deep infection was healed using antibiotics with surgical revision and debridement in one of 10 patients with reintervention but there was no indication for re-rearthroplasty. The deep infection was not healed using revisions and debridements in one of those 10 patients but that patient did not agree for re-rearhtroplasty which was recommended. The patient died 10 years after rearthroplasty. The accidental fall caused postoperative periprosthetic femur fracture in two patients did not need re-rearthroplasty because the femur stems were not mobilized. The femur osteosynthesis was performed in these patients.

Discussion and Conclusion

Although the results of the hip rearthroplasty were not satisfying as they are after primary procedures, it is the method of choice after unsuccessful primary total

TABLE 3
THE RESULTS OF THE HARRIS HIP SCORE

Harris hip score	Revision total hip endoprosthesis							
Grading (points)	Uncemented		Cemented		Hybrid		Total	
	N_0	%	N_0	%	N_0	%	N_0	%
Excellent 90–100	16	12,8	5	4	5	4	26	20.8
Good 80–89	40	32	12	9,6	22	17.6	74	59.2
Fair 70–79	9	7.2	4	3,2	8	6.4	21	16.8
Poor <70	2	1.6	1	0,8	1	0.8	4	3.2
Total	67	53.6	22	17.6	36	28.8	125	100

Fig. 3. AP left hip x-ray of the 60 years old patients with deep infection with meticilin-resistent Staphylococcus aureus (MRSA), a – periprosthetic femur fracture osteosynthesis with plate and srews, b – hip rearthroplasty with revision uncemented total endoprothesis (S-ROM) after safety interval of six months, c – Girdleston's procedure after reinfection two months later, d – re-revision hip rearthroplasty with uncemented total endoprothesis (ZMR) after safety interval of two years.

arthroplasty[16]. Despite the fact that the total hip arthroplasty can secure a chance for good functional result, the reconstruction of stabile and functional joint presents a technical challenge if there are severe soft tissue scar changes, changed anatomical relations, and poor bone stock. Patients undergoing a revision are older, more often obese and have more medical and orthopedic comorbidities which causes a strong negative influence on the revision procedure result[17].

The number of revision total hip arthroplasties is 10% of all primary hip arthroplasties in our study. According to Finnish arthroplasty register the annual incidence of both primary and revision total hip arthroplasties has increased between 1980 and 1988 from 9.8% to 13.6%[18]. The Swedish THA register showed in the last ten years, toward increased revisions in the elderly (patients more than eighty years of age), while the revision rates for patients sixty to seventy years of age have appeared to be decreasing and those for patients sixty years of age or younger have been constant[5]. The Swedish THA register showed lower number of revisions which could be an effect of different definitions for revisions[19].

The most usual indication for rearthroplasty was total hip endoprosthesis aseptic loosening (88.8%) in our study which is comparable with the most of published reports[2,6].

The average Harris hip score was 79 to 94 points after total revision hip arthroplasty in the existing literature[7,20], which is similar to our results where 80% of patients achieved good to excellent results.

Sixteen patients received impacted morselized femoral head bone allografts to fill up the bony defects in acetabulum in order to restore the bone stock with a press-fit cup. All patients had a good retention of the acetabular component. The combination of a press-fit cup with morselized bone graft seems to be a reliable solution[20], while the femoral head structural allograft has a higher rate of resorption[21]. We used a femoral head structural allograft for acetabular reconstruction in loss of bone from the superior acetabular dome in five patients. Two hips had femoral head allograft resorption.

In our study, there were 21.6% complications after the revision total endoprosthesis arthroplasty. The most usual complications were: dislocation (4%), and deep infection (4%). Chen and el. had 36% of complications[22]. The dislocation is relatively common complication after hip rearthroplasty. Khatod et al. reported about 1.7% of dislocations for primary total hip endoprostheses and 5.1% for hip rearthroplasties[23] whereas the rate of dislocations was up to 11% in other reports[6,24].

The incidence of infection was 7.2% in our study while the infection as the reason for revision can be found up to 14.8% in literature[25]. The risk for infection after hip rearthroplasty is increased if the primary implanted endoprosthesis is infected[22]. Using cementless revision cups and cementless modular revision stems with two-stage revisions of periprosthetic infections of the hip in combination with specific local and systemic antibiotic therapy could eradicate septic hip prostheses[26]. But, despite that, two of our patients had reinfection with MRSA after that procedure.

The incidence of periprosthetic femur fracture was increased after revision. It was between 3.6% and 20.9% according to Lindahl[27]. The risk factors are: comorbidity, higher femur poor bone stock, and intraoperative window or femur perforation[28]. The periprostetic femur fracture was caused by fall over crutches in one patient in our study and by fall over the coffin in his apartment in another patient. The femur stems were not mobile in both of our patients. In those patients we could describe the »happy hips« according to the Coventry classification system groups[29]. There was no reason for endoprosthesis replacement except for femur osteosynthesis. There were 10 (8%) patients who underwent second revision procedure which is comparable to published reports[2,8]. The reasons for re-revision surgery differed from those for revision surgery, with higher frequencies of infection (9%) and dislocation (11%)[6].

We can conclude that our results, from 122 treated patients who responded to our call for participation in this study, are comparable with the most of the published reports and they showed that the revision procedures are associated with the higher complication rate.

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KOMPLIKACIJE NAKON REARTROPLASTIKE KUKOVA REVIZIJSKIM ENDOPROTEZAMA

SAŽETAK

Zbog velikih defekata ili oslabljene koštane mase nailazimo na poteškoće u stabilizaciji komponenata revizijskih endoproteza, zbog čega su komplikacije mnogo češće nego u primarnih aloartroplastika. Cilj ovog istraživanja je utvrditi zastupljenost komplikacija u naših bolesnika. Retrospektivno smo ispitivali 122 pacijenta kod kojih je ugrađena totalna revizijska endoproteza kuka, s tim da je kod tri pacijenta učinjena revizijska artroplastika oba kuka. Prosječno vrijeme praćenja bilo je četiri godine (0,6–10,6 godina). Ukupno je bilo 32 (26,2%) muškaraca i 90 (73,8%) žena. Prosječna dob pacijenata je bila 70,66±7,63 godina. Prosječno vrijeme od operacijsskog zahvata do početka fizikalne terapije je bilo 3,53±2,56 dana. Ukupno imali smo 27 (21,6%) komplikacija. Najčešća je komplikacija bila infekcija u 9 (7,2%) pacijenta od čega je površnu infekciju imalo 4 (3,2%), a 5 (4%) duboku infekciju. Od ostalih komplikacija, 5 (4%) je imalo reluksaciju endoproteze, 2 (1,6%) periprotetički prijelom femura, 5 (4%) uroinfekciju, a ostalih 6 (4,8%) pacijenata neku drugu komplikaciju (po jednu mikroemboliju pluća, infarkt miokarda, leziju lumbalnog pleksusa od visine L2, inzult kralješnične moždine s paraplegijom, pneumoniju i veći dekubitus sakralne regije). Imali smo 10 re-revizijskih zahvata (8%). Ishod je u 80% bolesnika bio dobar ili izvrstan, u 17% zadovoljavajući i u 3% loš. Revizijski zahvati endorpoteze kuka praćeni su visokom učestalošću komplikacija s čime su kompatibilni i rezultati naše studije.